

DEFENSE SYSTEMS MANAGEMENT COLLEGE



PROGRAM MANAGEMENT COURSE

INDIVIDUAL STUDY PROGRAM

EVALUATION FACTORS TO CONSIDER WHEN PLANNING AND CONDUCTING AN AIR FORCE AIRCRAFT QUALITATIVE MAINTAINABILITY TEST AND EVALUATION AT A TEST SITE

STUDY PROJECT REPORT
PMC 77-1

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TEST AND EVALUATION AT A TEST SITE

Individual Study Program

Study Project Report

Prepared as a Formal Report

Defense Systems Management College

Program Management Course

Class 77-1

by

William H. Drake
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May 1977

Study Project Advisor
Mr. Wayne J. Schmidt

This study project report represents the views, conclusions and recommendations of the author and does not necessarily reflect the official opinion of the Defense Systems Management College or the Department of Defense

**EVALUATION FACTORS TO CONSIDER WHEN
PLANNING AND CONDUCTING AN AIR FORCE AIRCRAFT QUAL-
ITATIVE MAINTAINABILITY TEST AND EVALUATION AT A
TEST SITE**

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STUDY TITLE: EVALUATION FACTORS TO CONSIDER WHEN
PLANNING AND CONDUCTING AN AIR FORCE
AIRCRAFT QUALITATIVE MAINTAINABILITY
TEST AND EVALUATION AT A TEST SITE

STUDY PROJECT GOALS:

To identify significant evaluation factors which are fundamental to accomplishing an Air Force aircraft qualitative maintainability test and evaluation at a test site. To explore the scope of the evaluation that can be realistically accomplished in a test and evaluation environment at a test site by identifying the factors.

STUDY REPORT ABSTRACT:

The purpose of the study project was to identify significant evaluation factors which should be considered when planning and conducting an Air Force aircraft qualitative maintainability test and evaluation program at a test site.

Test and evaluation data included in Department of Defense (DOD) and individual DOD 5 volumes documents, professional publications, and the DOD Defense Systems Management College library sources were surveyed to identify evaluation factors. A total of 44 significant factors were identified. The author concluded the most important aspect regarding evaluation factors to consider when planning and conducting a qualitative maintainability test and evaluation is to identify the factors early and plan the evaluation program effectively using them as guides. Once the program is planned, evaluation managers must ensure evaluation personnel are fully aware of the factors to be evaluated and can relate their findings and evaluation results to the qualitative maintainability of the aircraft weapon system in the operational environment. The author recommends the study of effective methods to accomplish Air Force aircraft qualitative maintainability evaluations at test sites continue.

The report of the study project results are intended to serve as an aid and a source of information for personnel responsible for planning and conducting qualitative maintainability test and evaluation programs at test sites.

SUBJECT DESCRIPTORS: Aircraft Maintenance,
Maintainability,
Test and Evaluation

NAME, RANK, SERVICE

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EXECUTIVE SUMMARY

The Department of Defense continues to emphasize the importance of meaningful tests and evaluations of new weapon systems early in the system acquisition process. A key element in a weapon system's development test and evaluation and the operational suitability portion of its operational test and evaluation is an evaluation of its qualitative maintainability.

The purpose of this study project is to identify evaluation factors to consider when planning and conducting an Air Force aircraft qualitative maintainability test and evaluation at a test site. A total of 44 significant evaluation factors are identified. Fifteen of the factors are evaluation factors one should consider when "planning and conducting" an evaluation. Twenty-nine of the factors are evaluation factors one should consider for actually "evaluating" the aircraft weapon system. The most important aspect regarding evaluation factors to consider is to identify them early and plan the evaluation program effectively using the factors as guides. Once the program is planned, evaluation managers must insure evaluation personnel are fully aware of the factors to be evaluated and can relate their findings and evaluation results to the qualitative maintainability of the aircraft weapon system in the operational environment.

The report is intended to serve as an aid and a source of information for personnel responsible for planning and conducting qualitative maintainability test and evaluation programs at test sites.

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SECTION I

INTRODUCTION

Purpose of the Study Project

In a statement by Dr. Malcolm R. Currie, former Director of Defense Research and Engineering, to the Congress of the United States, 94th Congress, Second Session, 3 February 1976, on The Department of Defense Program of Research, Development, Test and Evaluation, FY 1977; Dr. Currie stated:

Test and Evaluation (T&E) provides the essential information required for effective management of the system acquisition process. We cannot make good decisions on the acquisition of systems without objective systems performance data. For this reason, I will continue to emphasize a strong, independent DOD T&E program. Our current T&E program has the following major objectives:

Continue to improve our capability for providing independent and objective T&E inputs to the weapon system acquisition process

Conduct adequate Development Test and Evaluation (DT&E) to verify that engineering designs are in hand and adequate Operational Test and Evaluation (OT&E) to verify operational effectiveness and suitability of new systems.....

The past few years have seen significant improvements in DOD procedures for conducting T&E of major weapon systems. High level emphasis on T&E was assured initially by creation of the Office of Deputy Director of Defense Research and Engineering (Test and Evaluation)....

Further strengthening of DOD T&E has been achieved by the establishment of independent operational T&E agencies within each of the Services....These agencies plan and conduct tests and submit their independent evaluations directly to the Chiefs of their respective Services....

The need for adequate T&E has been emphasized by the publication of appropriate DOD Directives. Specifically, DOD Directive 5000.3 clearly defines the role of T&E in the acquisition of major weapon systems. Other directives dealing with particular aspects of the weapons acquisition process include specific reference to required T&E procedures.

Additionally, the individual Services have published their own directives for implementation of DOD policies on T&E.

Test and evaluation continues to play a key role in the proceedings of the DSARC, which meets at each important milestone in a major weapon system acquisition program to consider whether the program should be advanced to its next phase. Prior to each DSARC meeting, the Deputy Director (Test and Evaluation) submits to each DSARC principal his independent evaluation of the adequacy of testing conducted to date and of testing planned for the future. He actively participates in DSARC discussions leading to recommendations on whether program advancement is warranted. Finally, after a DSARC review is completed, he submits directly to the Secretary of Defense his independent assessment of a program's T&E status for consideration along with the recommendations of the DSARC. In 1975 the DD(T&E) participated in 30 DSARC reviews of 27 different major programs.

In addition to periodic review by the DSARC, the T&E status of each major acquisition program is subject to a continuing review by the DD (T&E) and his staff. An important tool used in conducting these continuing reviews is the Test and Evaluation Master Plan (TEMP) which, in accordance with DODD 5000.3, is required for each major program. The TEMP provides an overall description of objectives, methodology and schedules for T&E to be conducted throughout the life cycle of a weapon system. Through a continual process of review and updating, the TEMP is made to accurately reflect current T&E requirements for a program. A significant benefit of the preparation of TEMPs is the early establishment of a close working relationship between the development and T&E agencies. In reviewing TEMPs the DD (T&E) is especially concerned that they include meaningful, specifically defined technical and operational performance objectives against which program progress can be accurately measured.... (30:X-1)¹

Dr. Currie's comments clearly indicate the continuing emphasis the DOD is placing on realistic, effective, and meaningful test and evaluations of new weapon systems. A recent January 18, 1977 reissue of DOD Directive 5000.1 "Major System Acquisitions", reemphasized the DOD's clear and definite position regarding the importance of test and evaluation commencing as early as possible in the major systems acquisition process.

¹This notation will be used throughout the report for sources of quotations and major references. The first number is the source listed in the bibliography. The second number is the page in the reference.

It states an estimate of the military utility and of the operational effectiveness and operational suitability including logistics support requirements will be accomplished prior to making a commitment to large-scale production. As realistic a test environment as possible and an acceptable representation of the future operational system will be used in the test and evaluation program (12:8).

As Dr. Currie indicated in his statement to Congress, the TEMP is an important tool for planning and conducting an effective test and evaluation program. A key element in a weapon system's DT&E and the operational suitability portion of its OT&E is an evaluation of its qualitative maintainability. Planning factors to accommodate the evaluation of qualitative maintainability and the provisions for conducting the evaluation are included in the TEMP.

The purpose of this study project is to identify and understand the significant evaluation factors which should be considered when planning and conducting an Air Force qualitative maintainability test and evaluation at a test site in order to provide meaningful recommendations for personnel responsible for preparing the qualitative maintainability evaluation portion of test plans and conducting such tests and evaluations.

Specific Goals of the Study Project

The specific goals of the study project are to identify significant evaluation factors which are fundamental to planning and conducting an Air Force aircraft qualitative maintainability test and evaluation at a test site and to explore the scope of the evaluation that can be realistically and meaningfully accomplished in a test and evaluation environment at a test site by identifying the factors.

Definitions

The reader is assumed to be reasonably familiar with the terms used in this report. Terms which are unique to the study project are defined within the text of the report.

Scope of the Study Project

It became readily apparent to the author when selecting his study project that it would be necessary to define the scope of the study in sufficient detail to permit the reader to fully understand its limits. Volumes of material could be written on the general subject of aircraft maintainability test and evaluation. However, the author elected to investigate a very limited aspect of this broad subject. The study specifically pertains to qualitative maintainability test and evaluation factors for United States Air Force aircraft. The evaluation is that which can be accomplished by maintenance personnel physically located at a test site. Interfaces with personnel and activities beyond the geographical boundaries of the test site, which impact on the test site evaluation, are discussed where appropriate. The qualitative maintainability evaluation is accomplished within the constraints of a DT&E and Initial Operational Test and Evaluation (IOT&E) environment. The study project does not address follow-on OT&E accomplished subsequent to a favorable DSARC Milestone III Production and Deployment Decision. Only those evaluation factors which are considered to be significant ones which should be considered when planning and conducting the qualitative maintainability test and evaluation are investigated.

Organization of the Report

Section I includes a statement of the purpose of the study project, the specific goals of the project, definitions, the scope of the study project, and the organization of the report.

Section II contains a discussion of the evaluation factors which define the environment in which the qualitative maintainability test and evaluation is conducted and identifies all individual evaluation factors to consider when planning and conducting an Air Force aircraft qualitative maintainability test and evaluation at a test site.

Section III includes an analysis and evaluation of the individual evaluation factors.

Section IV presents conclusions, recommendations, and implications arrived at by the author based upon the study effort documented in this report.

SECTION II

EVALUATION FACTORS TO BE CONSIDERED

The Environment

There are numerous factors which define the environment in which an Air Force aircraft qualitative maintainability test and evaluation is conducted at a test site. This discussion identifies some which the author considers significant and should be considered when planning and conducting the evaluation program.

The test and evaluation is often conducted as a combined DT&E and IOT&E effort. In most cases, particularly in the early stages of test and evaluation during the validation and full scale development phases, DT&E will take priority over IOT&E (1:28).

Air Force personnel responsible for accomplishing the qualitative maintainability evaluation will be representatives of the developing command and Air Force Test and Evaluation Center (AFTEC) test team personnel representing the using command, supporting command, and training command. In recognition of the fact that the evaluation program will often be a combined DT&E and IOT&E effort, DT&E accomplished by the developing command personnel and IOT&E accomplished by the AFTEC test team personnel must be well coordinated (22:14). Contractor personnel will also be performing qualitative maintainability evaluations as a part of their contractual maintainability evaluation responsibilities.

In almost every case the contractor will be responsible for maintaining the aircraft. Depending upon the arrangements that have been agreed upon between the Air Force and the contractor, Air Force maintenance personnel

may participate in maintenance activities in an observer or hands-on capacity. The maintenance activities can include both on-aircraft and off-aircraft maintenance (9:23).

There may not be preliminary Air Force type technical data available. The only maintenance data available may be contractor engineering drawing type data which has little resemblance to Air Force type technical data (2:15).

Only limited operational support and test equipment may be available in the flight test program. Some of this equipment may be government furnished equipment that has been qualified for use with other weapon systems but has not yet been qualified for the aircraft or equipment being tested. Some may be contractor furnished equipment (CFE) which is almost like or functionally like the equipment which the contractor is proposing be used in the operational environment. In many cases, much of the equipment will be CFE which only has application for the flight test program (2:15).

There are almost certain to be numerous differences between the configuration of the test aircraft and the production aircraft. In most cases the test aircraft will contain a large amount of flight test instrumentation hardware and wiring that interferes with the accomplishment of maintenance (6:G-13).

Maintenance will generally not be performed in the flight test environment in the same manner it is projected to be accomplished in the operational environment. If little maintenance technical data is available, many discrepancies may be corrected through a process of a test engineer determining the disposition of a discrepancy and working with the

appropriate maintenance personnel to fault isolate and correct the discrepancy. Many maintenance tasks such as corrective maintenance, scheduled maintenance, and inspections may extend over prolonged periods of time (several days), in lieu of being accomplished as single uninterrupted maintenance tasks as they might be performed in the operational environment (6:10).

Maintainability demonstrations are often planned as a part of the qualitative maintainability evaluation program. However, in many cases scheduling the inspections and accomplishing them is difficult because of real or perceived problems of the demonstration interfering with what are determined to be more important aspects of accomplishing the overall test program; for example, getting the aircraft repaired expeditiously in order to fly it again soon in lieu of accomplishing a scheduled maintainability demonstration (9:23).

These are only a few of the factors which define the test and evaluation environment in which a qualitative maintainability evaluation may be conducted. However, they do define the environment sufficiently enough to permit a better understanding of the significance of the individual qualitative maintainability evaluation factors that are identified in the discussion that follows.

Individual Evaluation Factors

Many people might be inclined to say that there are an endless number of factors one should consider when planning and conducting a qualitative maintainability evaluation at a test site. The author tends to agree. However, in this study project he attempts to identify and explore those which he considers to be most significant.

When considering the factors, it is appropriate to identify them in two different categories. One category deals with evaluation factors one should consider when "planning and conducting" the evaluation. These might be thought of as administrative factors. The other category deals with the evaluation factors one should consider for actually "evaluating" the aircraft weapon system.

Many of the factors in the first category are the same or are closely related to the previously identified factors which define the environment in which test and evaluation is conducted at a test site. Both planners and conductors of qualitative maintainability test and evaluation programs must give proper attention to these environmental factors. To recapitulate, the eight environmental factors discussed were: 1) combined DT&E and IOT&E, 2) composition of the maintenance evaluation personnel, 3) contractor/Air Force observer or hands-on performance of maintenance, 4) type of technical data, 5) type of support and test equipment, 6) aircraft and equipment configuration, 7) methods of performing maintenance in the flight test environment compared to the methods projected for use in the operational environment, and 8) accomplishing maintainability demonstrations.

There are additional factors one should consider in "planning and conducting" the evaluation. The number and qualifications of individual maintainability evaluation personnel needed to accomplish the evaluation must be determined. Individual personnel and total evaluation team personnel capabilities must be assessed in order to effectively plan a realistic evaluation program level of effort.

Contractor data systems that can be used as sources of maintainability evaluation data must be identified and plans made to obtain necessary data as appropriate (3:3-7).

Air Force data collection, processing, and evaluation systems should be identified or developed for use in the evaluation program (18:13).

Planning activities should include insuring the availability of contractor and Air Force maintenance planning documents for use in the evaluation program. These include such documents as integrated logistics support plans, maintenance plans, using command concepts of employment, maintenance engineering analyses, and optimum repair level analyses (19:5).

Determinations should be made regarding the desirability of having test site evaluation personnel participate in off site contractor and Air Force weapon system reviews. If so, provisions for their participation should be included in appropriate planning documents (5:8-5).

Determinations should be made regarding the desirability and capability of test team personnel to evaluate and report on, in total or in part, qualitative maintainability factors whose data and/or results are collected or determined at locations other than the test site.

Evaluation planning should include determinations of the methods that will be used to report the qualitative maintainability evaluation results, who will receive the reports, and the frequency of reporting.

As defined earlier, a second category of evaluation factors deals with the evaluation factors one should consider for actually "evaluating" the aircraft weapons system. This involves evaluating both on and off-aircraft equipment. The following list identifies some of the more significant

qualitative maintainability evaluation factors.

1. Evaluation of the maintenance plan and the adequacy of the maintenance elements of the support concept as applicable (6:G-2).
2. Ground servicing provisions and procedures.
3. Equipment installation provisions and procedures.
4. Inspection requirements.
5. Repair level analyses.
6. Software maintainability.
7. Self sufficiency capability.
8. Accessibility of parts, test points, adjustments, and connections.
9. Test instrumentation effects on end item performance.
10. Accessibility/adaptability for in flight maintenance.
11. Design-dictated or permitted preventive maintenance actions.
12. Proliferation of special maintenance tools.
13. Susceptibility to incorrect maintenance actions.
14. Susceptibility to damage.
15. Adequacy of safety and protective equipment.
16. Adequacy of standardization and interchangeability features.
17. Adequacy of security.
18. Adequacy of fail-safe design features.
19. Adequacy of corrosion prevention and control.
20. Adequacy of time change procedures.
21. Adequacy of post-maintenance operational checks.
22. Special handling criteria.
23. Size and weight limitation criteria.
24. Environmental extreme criteria.

- 25. Weapons load criteria.
- 26. Alignment and calibration criteria.
- 27. Cyclic operation/duration limits criteria.
- 28. Mission variation criteria.
- 29. Human factors engineering (7:4-251).

SECTION III

ANALYSIS AND EVALUATION OF INDIVIDUAL EVALUATION FACTORS

In the preceding section, 44 individual evaluation factors to consider when planning and conducting an Air Force qualitative maintainability test and evaluation at a test site were identified. Fifteen of them dealt specifically with the evaluation factors one should consider when "planning and conducting" the evaluation; 29 of them dealt with the evaluation factors one should consider for actually "evaluating" the aircraft weapon system. It is not the author's intent to individually report the analysis and evaluation of each of the 44 individual evaluation factors. In the discussion that follows the author analyzes and evaluates all of the factors collectively, stressing points regarding individual factors he deems warrant special comment.

One thing that is common to all of the evaluation factors is the fact that they are factors which determine the quality and thoroughness of the qualitative maintainability evaluation that can be accomplished at a test site. Some of the factors represent greater challenges than others for personnel responsible for planning and conducting the evaluation program. Certainly proper recognition of the test environment is fundamental in identifying significant factors which should be considered.

An analysis and evaluation of all the factors highlights the importance of proper planning in dealing with each of them (10:5). Many of the factors are related and the planning considerations for accommodating them are likewise related. One of the most important considerations in dealing with each factor individually or several related ones as a group is to begin the

planning effort early. This effort involves early identification of the total qualitative maintainability evaluation requirements, effective communication and coordination with all activities involved in the test planning effort, and thorough documentation of all planning factors in test planning documents.

All of the individual evaluation factors are significant; however, the analysis and evaluation of all the factors tends to indicate the 15 factors one should consider when "planning and conducting" the evaluation are of greater significance than the 29 factors one should consider for actually "evaluating" the aircraft weapon system. The reason is that the quality of the evaluation accomplished in terms of the 29 "evaluating" factors is significantly dependent upon the overall quality of the qualitative maintainability evaluation program planned and conducted in terms of the attention given to the 15 "planning and conducting" factors.

The most important aspect regarding the 15 factors which define the environment in which a qualitative maintainability test and evaluation is conducted is to insure that test personnel purposefully consider each applicable factor when planning and conducting the evaluation.

With proper planning, factors relating to the combined accomplishment of DT&E and IOT&E should not present any unsurmountable obstacles to effective accomplishment of both DT&E and IOT&E. IOT&E personnel should be able to accomplish their evaluation with no danger of compromising the required independency of the AFTEC evaluation (31:50). In order to capitalize on the advantages of Air Force personnel performing hands-on maintenance with the contractor maintenance personnel, planning should

include provisions for adequate training by the contractor (2:16). In some cases certification by the contractor of the Air Force maintenance personnel's qualifications to work on the weapon system hardware is a desirable objective to pursue. Joint Air Force and contractor performed maintenance must be viewed in terms of the impact on the overall flight test program. Areas of concern include such things as the impact of maintenance performed by Air Force personnel on safety, weapon system performance, quality of maintenance, adherence to schedules, etc.

The major element involved with the four environmental factors of preliminary technical data, limited operational support and test equipment, prototype configuration of the weapon system, and the method of performing maintenance in the flight test environment versus the operational environment, is the fact that a major portion of the qualitative maintainability evaluation results are dependent upon the judgement of experienced, well trained Air Force maintenance personnel. They must be able to accurately extrapolate their observations and findings from the flight test environment into a meaningful evaluation of the weapon system's qualitative maintainability in the operational environment (7:5-49).

The last factor which defines the environment in which an evaluation is conducted, maintainability demonstrations, highlights the very important issue of prior planning for the conduct of the evaluation program. Decisions must be made regarding what kind of maintenance demonstration programs will be implemented. Programs may vary considerably in scope. Some evaluators may want scheduled, formal, staged demonstrations. Others may elect to wait until an unscheduled event occurs and then conduct a formal demonstration. Others may be willing to forego formal demonstrations and obtain

most of their evaluation findings through continuing observer and hands-on maintenance activities with the contractor. A key element in developing a maintenance demonstration program is determining which maintenance tasks will be demonstrated.

The remaining "planning and conducting" evaluation factors were not identified as defining the environment in which the evaluation is conducted at a test site. They included evaluation personnel requirements, contractor data systems, Air Force data systems, maintenance planning documents, off site participation by evaluation personnel in review activities, evaluation of data and evaluation results coming from off site, and methods of reporting evaluation results. An analysis and evaluation of these factors indicates that effective planning and firm commitments to specific management philosophies are absolutely essential in effectively accommodating the factors into the maintainability evaluation program. These factors define an area of many management decisions and failure to expend an appropriate level of early effort in addressing them will often lead to a less than satisfactory evaluation program. Although the significance of each of these factors should be readily apparent, it is appropriate to further comment on a few of them.

In developing Air Force data collection systems the use of checklists, questionnaires, and formatted evaluation sheets may often be appropriate for gathering qualitative type data. Use of mechanized data systems for processing the data should be considered. Opportunities for Air Force maintenance personnel to participate in flight debriefings often provides vital data needed in evaluating qualitative maintainability.

Participation by evaluation personnel in off site weapon system review activities such as PDRs, CDRs, mockup reviews, etc., is often very profitable. It permits the evaluation personnel to gain additional knowledge regarding the weapon system design and configuration and also permits the personnel to make meaningful inputs to the reviews as appropriate.

Careful consideration should be given to the determination of whether test site evaluation personnel will evaluate and report on factors whose data and/or results are collected or determined at locations other than the test site. Factors such as the feasibility of sending personnel to the off site locations to gather the data, the capability of the personnel to adequately interpret data gathered by others at the remote locations, the time available to adequately accomplish the on site evaluation as well as the off site evaluation, etc., should be carefully considered. An example of this type situation is requiring test site personnel to evaluate and report on the qualitative maintainability of the weapon system at the organizational, intermediate, and depot levels when the majority of their evaluation effort is devoted to organizational level maintenance at the test site. Also, test site personnel may possess the skills necessary to evaluate organizational and intermediate level maintainability, but not depot level maintainability.

The analysis and evaluation of the 29 evaluation factors one should consider for actually "evaluating" the aircraft weapon system (pages 11-12) is quite straight forward. It indicates the primary emphasis that must be directed toward accomplishing all of the individual evaluations is proper planning and education to insure evaluation personnel are fully aware of the factors to be evaluated and can relate their findings to the

qualitative maintainability of the aircraft weapon system in the operational environment.

Two additional items of interest merit comment as a result of the analysis and evaluation of the 44 qualitative maintainability factors. They are the interchange of qualitative maintainability information between Air Force and contractor evaluation personnel and the interface of the qualitative maintainability evaluation with other operational suitability evaluation factors.

It may be mutually beneficial to the Air Force and contractors if an effective program of qualitative maintainability information interchange is effected at the test site. This program could involve Air Force personnel providing contractor personnel with evaluation data, both positive features and discrepancies, to inform contractors of the Air Force's findings. Contractor personnel could investigate possible solutions to discrepancies and respond to the Air Force regarding possible changes. In this manner qualitative maintainability problems could be identified at a very low level and possible solutions investigated without having to elevate the problem initially to a formal Deficiency Report or Engineering Change Proposal status (16:14). This program is in no way intended to circumvent formal contractual requirements regarding the submittal of government requests to contractors for accomplishment of work or implementation of changes.

The second item of interest deals with the fact that the qualitative maintainability evaluation will interface directly with other operational suitability evaluation factors and in many cases will have some impact on them. These other factors include reliability, quantitative maintainability,

availability, and logistics supportability. Qualitative maintainability evaluation personnel must be constantly alert to the fact that these interfaces may be potential sources of tradeoffs in an effort to achieve an optimum level of operational suitability (14:3).

SECTION IV

SUMMARY

Conclusions

The DOD is continuing to emphasize the importance of realistic, effective, and meaningful tests and evaluations of new weapon systems. It is important that test and evaluation commence as early as possible in the system acquisition process, and an estimate of the military utility and the operational effectiveness and operational suitability including logistics support requirements be accomplished prior to making a commitment to large-scale production. A key element in a weapon system's DT&E and the operational suitability portion of its OT&E is an evaluation of its qualitative maintainability.

The author identifies 44 evaluation factors to consider when planning and conducting an Air Force aircraft qualitative maintainability test and evaluation at a test site. He concludes that it is appropriate to identify them in two different categories. One category deals with 15 evaluation factors one should consider when "planning and conducting" an evaluation. The other category deals with 29 evaluation factors one should consider for actually "evaluating" the aircraft weapon system.

An analysis and evaluation of the evaluation factors reveals the importance of beginning the planning effort for the qualitative maintainability evaluation early in the acquisition program. Also, the author concludes that the quality of the qualitative maintainability evaluation accomplished in terms of the 29 "evaluating" factors is significantly dependent upon the overall quality of the maintainability evaluation

program planned and conducted in terms of the attention given to the 15 "planning and conducting" factors. The 44 individual evaluation factors identified define the scope of the evaluation that can be realistically accomplished in a test and evaluation environment at a test site.

In summary, the author concludes the most important aspect regarding evaluation factors to consider when planning and conducting a qualitative maintainability evaluation is to identify them early and plan the evaluation program effectively using the factors as guides. Once planned, evaluation managers must insure evaluation personnel are fully aware of the factors to be evaluated and can relate their findings and evaluation results to the qualitative maintainability of the aircraft weapon system in the operational environment.

Recommendations

The author recommends the study of effective methods to accomplish Air Force aircraft qualitative maintainability evaluations at test sites continue. More information on how to plan and conduct evaluation programs would be helpful for those responsible for accomplishing them. A need exists to increase the understanding of personnel at all levels in the Air Force on optimum methods to accomplish an aircraft qualitative maintainability evaluation at a test site.

Implications

The implications of this study project are that it identifies factors which the author considers significant to be considered in planning and conducting an aircraft qualitative maintainability test and evaluation program at a test site. It can serve as an aid and a source of

information for personnel responsible for planning and conducting such
a test and evaluation program.

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